Title: Africa in Abundance

Link to Outcomes:

- **Number Relationships** Students will demonstrate their ability to describe and apply number relationships using concrete and abstract materials. They will choose appropriate operations and describe effects of operations on numbers.

- **Statistics** Students will demonstrate their ability to collect, organize and display data, and will interpret information obtained from displays. They will write reports based on statistical information.

- **Problem Solving** Students will demonstrate their ability to solve problems in mathematics including problems with open-ended answers, problems which are solved in a cooperative atmosphere, and problems which are solved with the use of technology.

- **Reasoning** Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.

- **Cooperation** Students will demonstrate the ability to work in groups to collect and organize data. They will develop an end product based on their interpretation of fractions, decimals, and percents.

- **Communications** Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with language and the signs, symbols, and terms of the discipline.

- **Technology** Students will demonstrate the ability to perform mathematical calculations using calculators.

- **Connections** Students will draw on their knowledge of Africa and the scientific method to collect and analyze data.

- **Probability** Students will determine probabilities based on data from examples and investigation.

- **Habits of Mind** Students will make decisions using data collected.

Brief Overview:

These activities integrate Maryland Functional Mathematics, Maryland School Performance skills, and the middle school World Culture curriculum. Students will use the given information on Africa to represent the area and population of the country as a specific fraction, decimal and percent of the continent's total. They will then complete a variety of activities that will allow them to expand and relate their knowledge of Africa and mathematics.

Grade/Level:

Grade 7 (World Culture students)

Duration/Length:

This activity will take 3 or 4 days. The activities may take longer then anticipated depending on class duration and student's prior knowledge.

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Estimating, rounding and place value
- Constructing fractions
- Calculating decimals
- Determining percents from a decimal or fraction
- Collecting and organizing data
- Determining percentages
- Using a protractor and compass

Objectives:

- Students will work cooperatively in groups.
- Students will collect and organize data from resources.
- Students will be able to use various strategies to solve problems.
- Students will be able to represent and use numbers in a variety of equivalent forms.
- Students will be able to predict and then determine a percent.
- Students will be able to describe relationships among fractions, decimals and percents.
- Students will be able to order numbers.
- Students will be able to construct a circle graph.
- Students will be able to evaluate a situation and give appropriate support for their answer.

Materials/Resources/Printed Materials:

- Atlas and/ or encyclopedia
- Pencils
- Paper
- Calculator
- Student worksheets 1-6
- Compass
- Protractor

Development/Procedures:

- Create a context for your students:
  The United Nations has asked if our school can lend them a few top students who are fluent in fractions, decimals and percents. They are working on a new construction code which will help them evaluate the size of a continent. The continent we are going to evaluate is Africa. Since the continent is rather large and has many countries, we are going to compare the area of various countries and try to complete their code.

- Develop an environment:
  Africa is the second largest continent in the world. It has over 50 countries that cover an area of 11,704,000 square miles. We will look at the current statistics available to determine the fraction of Africa's area in each country. Then we will convert that fraction to a decimal and then into a percent to help compare the size of each country to the continent as a whole.

- Discuss/review fractions, decimals and percents. Use teacher worksheet.

- Cooperative Activity: (worksheet 1)
  In groups of two or three, have students complete the "Africa in Abundance" ditto number one. Ask them to try to complete the calculations on paper first, using rounded answers. They may check their answers with a calculator.

- Independent Activity: (worksheet 2)
  Discuss with students how they could find the area of the other countries in Africa. Once enough information is gathered, have students complete worksheet 2 independently.

- Discuss/review circle graphs. Use teacher worksheet.

- Circle graph Activity: (worksheet 3)

- Bar graph Activity. (worksheet 7)

- Cooperative Activity: (worksheet 4)
  Have students complete the worksheet in groups. Next, as a class go over using a transparency on the overhead projector.

- Independent Activity: (worksheet 5)

Evaluation:

Students will be observed throughout the lessons for evaluation. While working in groups on worksheets, the teacher should look for group participation and cooperation. Ask various questions about the worksheet to make sure there is a general understanding of what is to be done. In addition teachers can check the worksheets for accuracy.

Extension/Follow Up:

1. Students can create bar graphs using information from worksheets (Worksheet 7). Compare their bar graph with their circle graph (worksheet 3).

2. Students can compile a list of all the countries of Africa in order from largest to smallest.

3. Students can write essays about why some continents might have many countries (like Africa) and some do not (like Australia).

4. Students can complete the same worksheets using population, land resources, vegetation or jobs.

5. Students can research one country and give oral report.

6. Students can write in journals about what they learned and how they felt about these activities.

7. Students can take a class or school poll about the country they would choose to live in and make a visual representation complied from that information to display for school.

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Africa in Abundance
Teacher Resource Worksheet

Review of Fractions, Decimals and Percents

Ask:

"What is the highest percent you can usually earn on a test?" (100)

"So if you earn 100 percent, how many problems did you get correct?" (All of them)

Give some examples of perfect scores:

$\frac{25}{25}$ $\frac{33}{33}$ $\frac{50}{50}$ etc.

Ask:

"What if you did not earn a perfect score?"

"What if you earn $\frac{85}{100}$ correct? "

"Could you determine your percent?"

"Can you make an estimate/ guess?"

Discuss:

Methods of estimation and rounding with the students.

Ask:

"How can we determine the exact percent?"

Discuss:

Method of division to determine decimal value of fractions or the method of place-value for fractions with denominators in powers of ten.

"The bar between the numerator and denominator represents which mathematical operation?"

Work through several examples using a variety of denominators.

Review of Circle Graphs

Explain:

The circle graph displays information as a picture. The whole circle represents Africa or a perfect test paper. The small slices of the circle represent the different countries that make up the whole continent or the incorrect problems on a test.

Ask:

"What percent would the whole circle represent? How many degrees are in a circle? in 50% of a circle? How would you find the number of degrees in 20% of a circle?

Look at the protractor on your desk.

"What is the highest degree that can be measured on it?"
"What does it look like?"
"How could we get a circle from the protractor?"
"Can you guess how many degrees would be in the circle?"

Discuss:

To make a circle graph, use these steps.

-Find the percent of the total each category represents.
-Find the number of degrees for each percent.
-Draw a central angle representing each percent.
-Label each section of the graph.
-Title the graph.

The circle graph is made by drawing a circle with your compass. Then you look at the data you need to place in the circle. If you had 4 percent of the area of Africa, we have to find 4 percent of the circle to represent the country. We can do this by taking 4 percent of the total number of degrees in the circle. That is, 4 percent of 360.

Review:

The multiplication process for finding various percentages of a number.

Discuss:

Once we find the percent the county would hold in the circle, this would be the degree measure to find in the circle. Draw a radius in the circle using a straight edge. Using the protractor, measure the angle value found. This process would be done for each country. On the ditto we only computed the angles for the 10 countries on worksheet 2.

Ask:

Where would we place the other pieces (percentages) if we had them? (In the area marked "other" countries.)

Name:_____ WS 1

Objective: Students will find the fraction, decimal, and percent of 10 countries in Africa compared to the whole continent of Africa.

Africa in Abundance

Area of Africa = 11,704,000 sq. mi.

(Hint: Round each to the nearest ten thousand.)

Country	Area in sq. mi.	Predicted %	Fraction	Decimal	Actual % Rounded
Angola	481,350	10%	$\frac{480,000}{11,700,000}$	0.04103	4%
Algeria	919,595				
Botswana	224,700				
Cameroon	183,569				
Egypt	386,662				
Ethiopia	437,340				
Guinea	94,926				
Liberia	38,250				
Libya	679,362				
Sierra Leone	27,699				
Sudan	967,500				

1. Which is the largest country in this group? Which is the smallest country in this group?_____

_____

2. Can a country have 0%?

_____

3. If we found the sum of all the countries in Africa what should our total square miles equal? What fraction, decimal and percent would it add up to be?

_____

_____

4. Order the countries from the largest to smallest.

_____
_____
_____
_____

5. Look at the percent compared to the area. Do you see a pattern? Write a paragraph explaining your observation. (You may want to use separate sheet or back.)

_____
_____
_____
_____
_____

Name:_____ WS 2

Objective: Students will find the the area of each country using an atlas or encyclopedia.
Students will then find the fraction, decimal and percent of the countries.

Africa in Abundance

Africa = 11,704,000 sq. mi.

Make sure you predict the percent after you complete the area of each country.

Country	Area in sq. mi.	Predicted %	Fraction	Decimal	Actual % Rounded
Angola	481,350	10%	$\frac{480,000}{11,700,000}$	0.04103	4%
Chad					
Kenya					
Mauritania					
Morocco					
Niger					
Nigeria					
Somalia					
South Africa					
Zaire					
Zimbabwe					

1. Where did you get your area in square miles? Why did you choose that resource?

_____

_____

2. Which is the largest country in this group? Which is the smallest country in this group?_____

_____

3. Order the countries from the largest to smallest. _____

_____

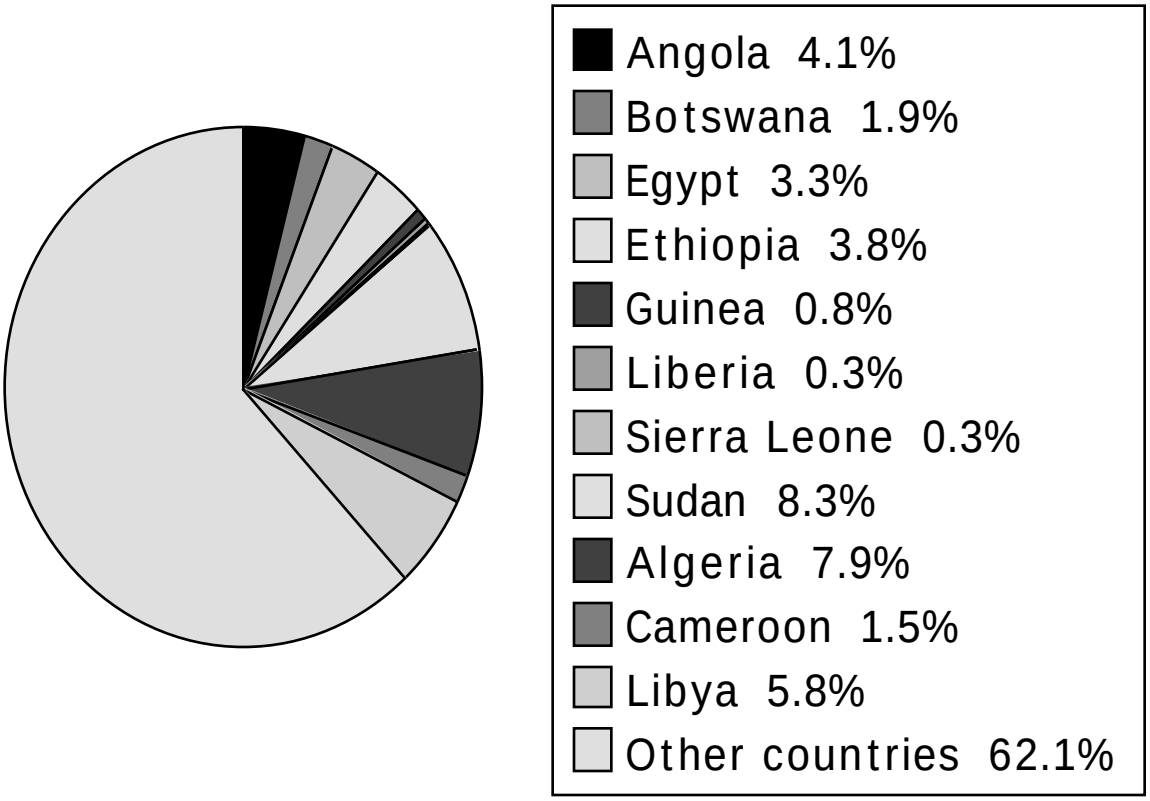
4. Compare your predicted percent with the actual percent. Tell about your observation. _____
_____
_____

5. Which one of your predicted percents was closest to the actual percent? How do you think this happened? _____
_____

Name:_____ WS 3

Objective: Students will answer questions using information from circle graph.

Africa in Abundance



1. What percent does the whole circle represent?_____

2. How can we tell which country is which without labels? _____
_____

3. What does the largest section (piece) of the circle graph represent? List some examples of what could be included in that piece? _____
_____

4. Without measuring, find the number of degrees in the central angle for each country.
_____
_____

5. Which is easier for you to interpret the circle graph or the table from worksheet 1? Why?_____
_____

Name_____ WS 4

Africa in Abundance

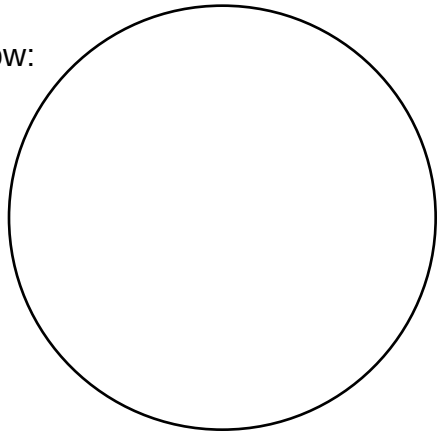
Given the following information, create a circle graph. Keep in mind, the total animal population of Africa is 1,000,000!

African animals:	# of animals:	% of animal population
Elephants	50,657	_____
Birds	100,211	_____
Giraffes	130,981	_____
Lions	212,310	_____
Monkeys	130,981	_____
Tigers	163,000	_____
Zebras	210,256	_____
Other	4,322	_____

CIRCLE GRAPH

African animals:	Degrees of circle (remember to multiply % of pop by 360)
Elephants	_____
Birds	_____
Giraffes	_____
Lions	_____
Monkeys	_____
Tigers	_____
Zebras	_____
Others	_____

Use your protractor to create your circle graph below:



In review:

To make a circle graph, use these steps.
-Find the percent of the total each category represents.
-Find the number of degrees for each percent
-Draw a central angle representing each percent
-Label each section of the graph.
-Title the graph

Name_____ WS 5

Africa in Abundance

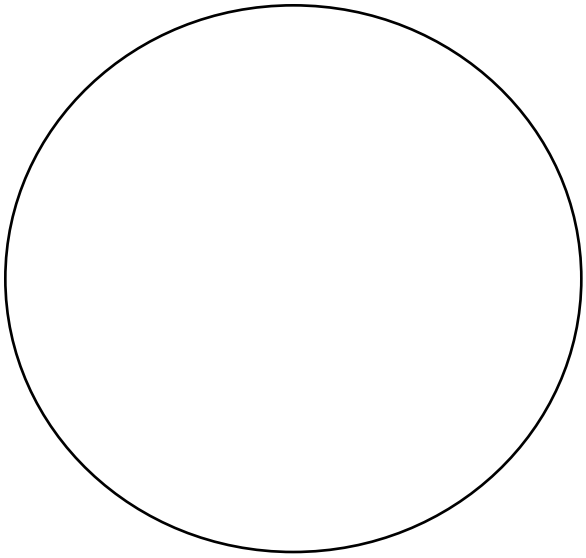
Given the following information, create a circle graph. Keep in mind, the total population of Africa is 555,000,000!

African languages:	# of people that speak it:	% of population
Congo-Kodofanian	222,000,000	_____
Nilo-Saharan	55,500,000	_____
Afro-Asiatic	166,500,000	_____
Khoisan	66,600,000	_____
Indo-European	16,650,000	_____
Malay-Polynesian	27,750,000	_____

CIRCLE GRAPH

African languages:	Degrees of circle (remember to multiply % of pop by 360)
Congo-Kodofanian	_____
Nilo-Saharan	_____
Afro-Asiatic	_____
Khoisan	_____
Indo-European	_____
Malay-Polynesion	_____

Use your protractor to create your circle graph below:



Name:_____ WS 6

Objective: Students will be able to extend their knowledge to bar graphs.

Africa in Abundance

(Extension worksheet)

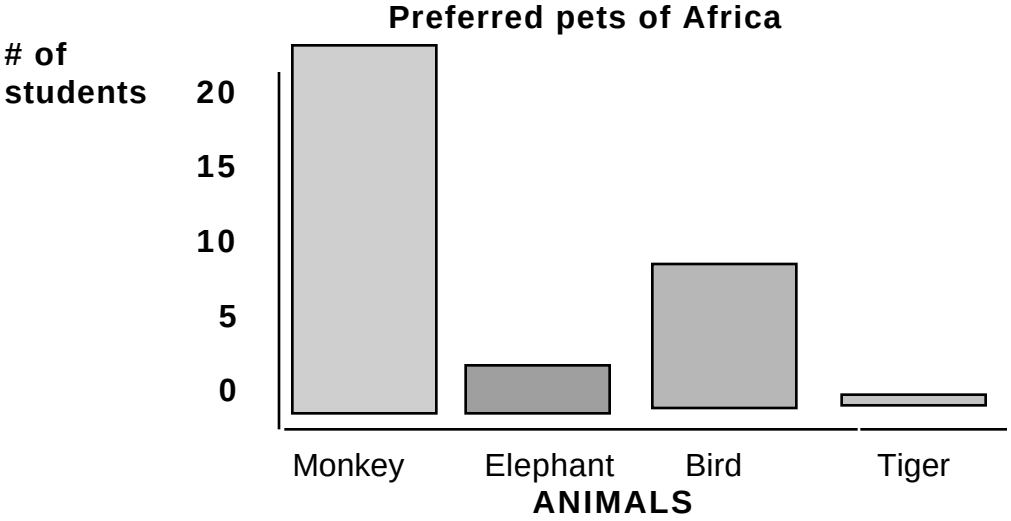
Step 1: Pick a topic about Africa that you are interested in. For example, the animals, job opportunities, products manufactured, etc.

Step 2: Construct a question which will allow you to poll your fellow students. For example, “if you lived in Africa, which country would you like to live in?” or “what animal do you think you would have as a pet if you lived in Africa?”.

Step 3: Keep track of your classmates answers on a tally sheet. See example below.

Animal Preference	Number of students who chose it:
Monkey	𝍸 𝍸 𝍸 𝍸 𝍸
Elephant	III
Bird	𝍸 𝍸I
Tiger	I

Step 4: Use your gathered data to construct a bar graph.



Name_____ WS7

Objective: Students will be able to extend their knowledge to bar graphs.

Africa in Abundance

(Extension worksheet)

I. Topic: _____

II. Question : _____

III. Tally sheet:

IV. Bar graph:

Answer Sheet for **Africa in Abundance**

Country	Area in sq. mi.	Predicted %	Fraction	Decimal	Actual % Rounded
Algeria	919,595		910,000 / 11,700,000	0.07863	8%
Angola	481,350	10%	480,000 / 11,700,000	0.04103	4%
Botswana	224,700		220,000 / 11,700,000	0.01880	2%
Cameroon	183,569		180,000 / 11,700,000	0.01538	2%
Chad	495,800		500,000 / 11,700,000	0.04274	4%
Egypt	386,662		390,000 / 11,700,000	0.03333	3%
Ethiopia	437,340		440,000 / 11,700,000	0.03761	4%
Guinea	94,926		90,000 / 11,700,000	0.00769	1%
Kenya	224,961		220,000 / 11,700,000	0.01880	2%
Liberia	38,250		40,000 / 11,700,000	0.00342	0%
Libya	679,362		680,000 / 11,700,000	0.05812	6%
Mauritania	395,956		150,000 / 11,700,000	0.03419	3%
Morocco	172,410		170,000 / 17,000,000	0.01453	1%
Niger	489,200		490,000 / 11,700,000	0.04188	4%
Nigeria	356,669		360,000 / 11,700,000	0.03077	3%
Sierra Leone	27,699		30,000 / 11,700,000	0.00256	0%
Somalia	246,200		250,000 / 11,700,000	0.02137	2%
South Africa	471,925		470,000 / 11,700,000	0.04017	4%
Sudan	967,500		970,000 / 11,700,000	0.08291	8%
Zaire	905,568		910,000 / 11,700,000	0.07778	8%
Zimbabwe	150,873		15,000 / 11,700,000	0.01282	1%